The Mining Journal

Established 1835 — Railway & Commercial Gazette

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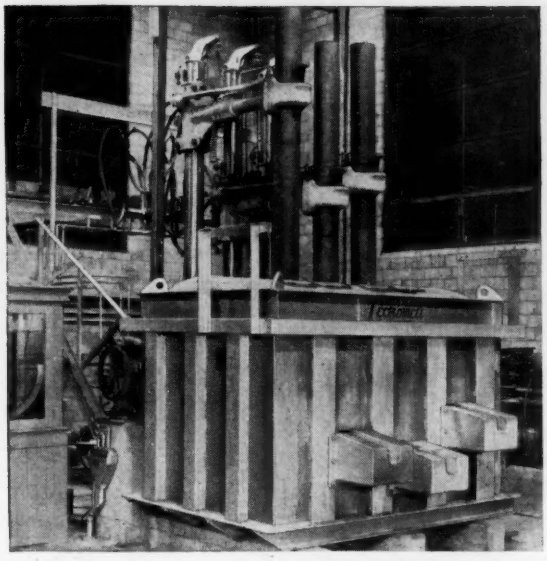

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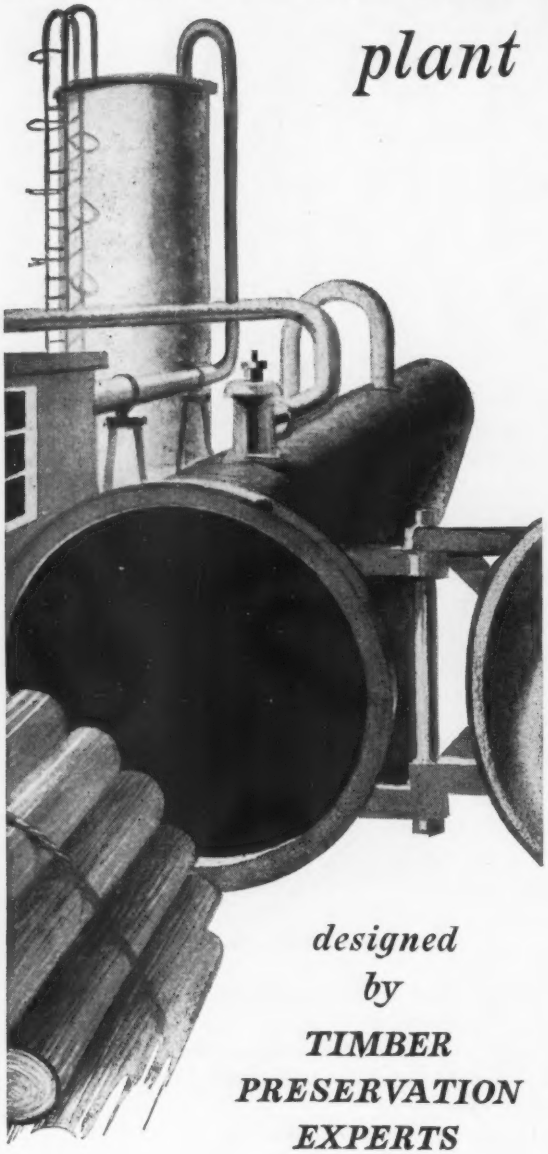

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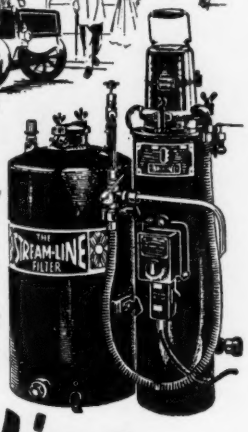

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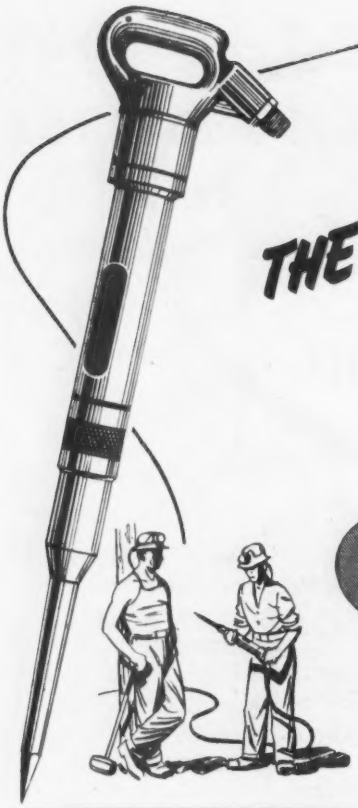

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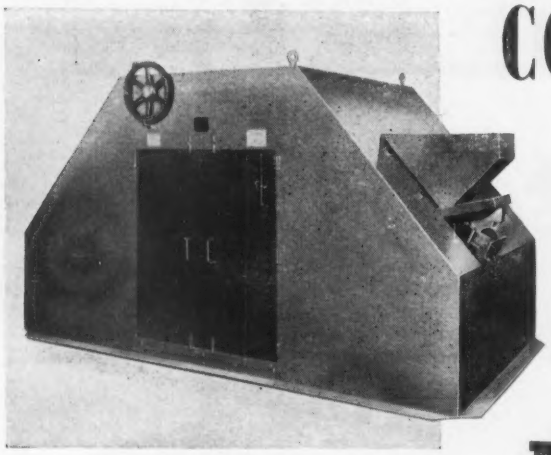

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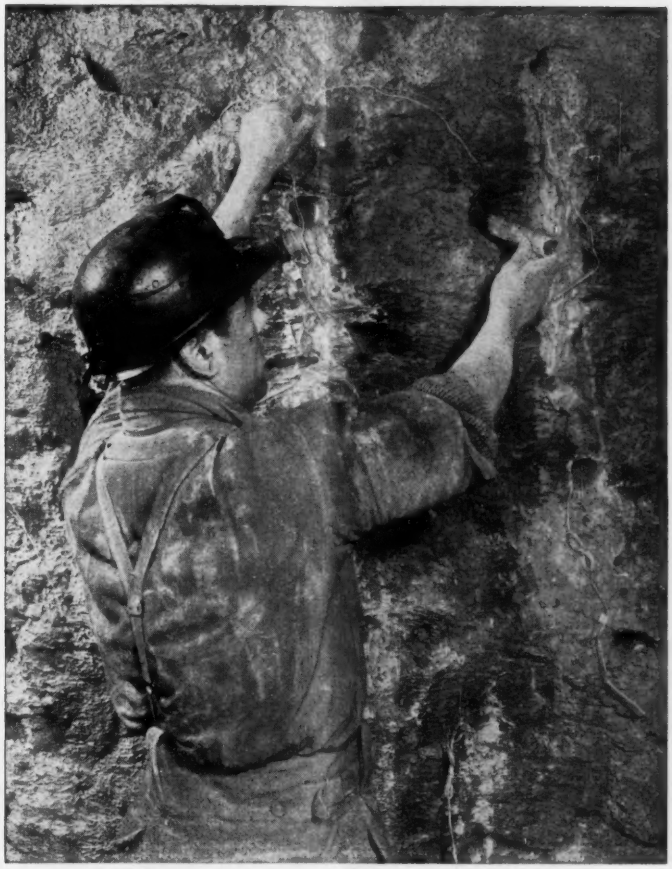

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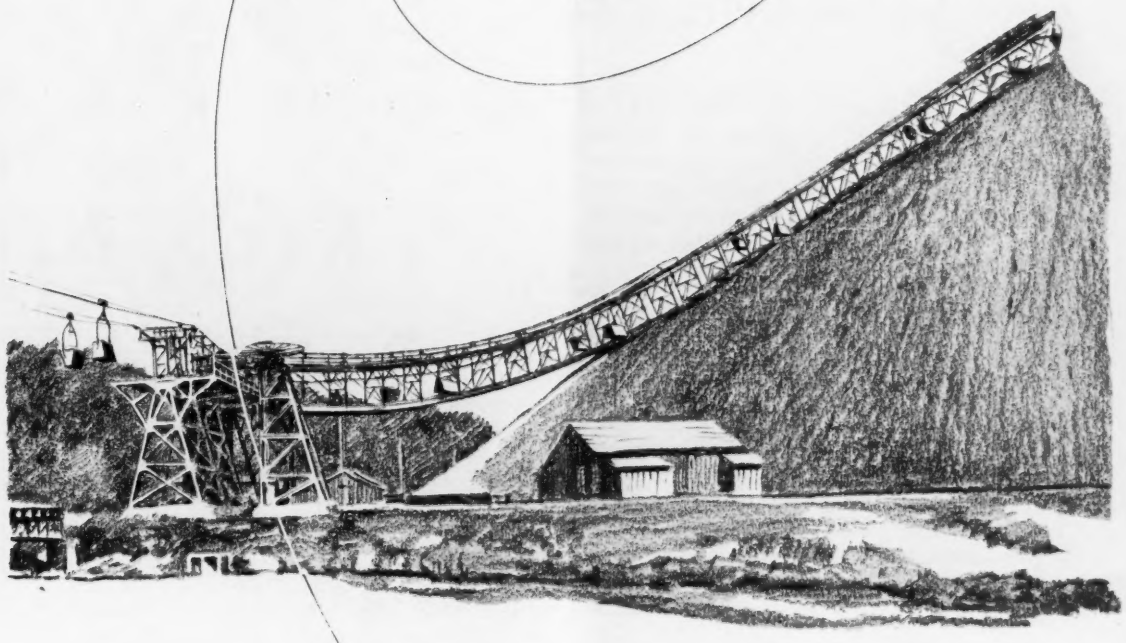

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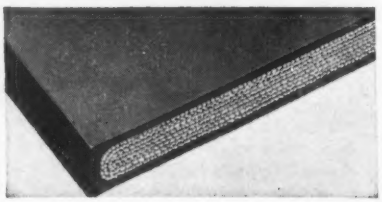

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The Mining Journal

Established 1835

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NOTES AND COMMENTS

President Eisenhower Takes a Political Decision

President Eisenhower's rejection of the U.S. Tariff Commission's recommendation for increased duties on lead and zinc has been followed by his announcement of a much accelerated programme of stockpile purchases. On the basis of the incomplete information at present available over here, the President's plan appears to be of three parts. (1) *Increased purchases at market prices of newly mined domestic lead and zinc.* This will be carried out under the new long-term stockpile programme under which the G.S.A. is to be authorized to buy up to 200,000 tons of lead and 300,000 tons of zinc in the year to June 30, 1955, equivalent to a monthly rate of 16,500 tons of lead and 25,000 tons of zinc compared with purchases in recent months of around 10,000 and 15,000 tons respectively. (2) *Acquisition of foreign lead and zinc under the new Agricultural Trade Development and Assistance Act.* Under this Act the Administration is authorized to barter surplus farm commodities for stragetic stockpile purchases. (3) *State Department representations to foreign lead and zinc producing countries.* These are to be directed towards urging foreign producers not to " take any unfair advantage " of increased stockpile purchasing " designed to aid U.S. production."

This third and seemingly naive step is presumably to be taken as no more than a political gesture for home consumption, as in the absence of the imposition by the Administration of strict import quotas (surely quite unthinkable), some increase in world prices must inevitably follow from the increase in domestic prices which the new programme seems to assure. With lead and zinc stockpile purchases around 10,000 and 15,000 tons respectively, supply and demand in America has been held steady in recent months and producers' stocks will very rapidly diminish if purchases are going to be increased by anything like the amount suggested in the President's statement.

The real nature of President Eisenhower's dilemma lies, of course, in the fact that while, with the November elections approaching, it is politically vital to pacify the western mining States, to do so by increasing tariffs would not only be somewhat problematical in its effectiveness but would come at a particularly awkward time now that the whole of the General Agreement on Tariffs and Trade (G.A.T.T.) is coming up for review.

The essentially political nature of the President's decision is reflected in the method of price support which he has adopted (namely of buying at the market price) which is by no means the most economical. Until this summer, while stockpile purchases were still motivated principally by strategic considerations, the Administration had been content to stimulate production by selective high price contract awards to high cost producers, and there is no doubt that an extension of this procedure would, from the taxpayers' point of view, have been the cheapest way of supporting the industry. As it turns out the taxpayer is going to have to pay the cost of political expediency.

What is, perhaps, of greater and more ominous import for the world at large, is the fact that the U.S. Administration has now made an open admission that it regards so called strategic stockpiling as an instrument of economic management and political manoeuvre quite as much as of national security. Hitherto, the convention has been maintained that stockpiling was for essentially strategic purposes and the market was thus given some assurance that tonnages drawn off from it in this way would be isolated more or less permanently. Now that stockpiling has become openly an instrument of price maintenance, and indirectly of protectionism, the fear that some time in the future accumulated stockpiles will be used by Washington to " regulate " world markets must appear that much more real. *L'appétit vienten mangeant.*

U.S. Aluminium Expansion Plans Dropped

The announcement from the Office of Defense Mobilization that it has cancelled its " third round " aluminium expansion programme calling for an increase of 200,000 tons a year in U.S. domestic aluminium capacity will not occasion much surprise.

It will be recalled that the purpose of the " third round " expansion programme was to bring new independent aluminium producers into the industry as well as to increase U.S. capacity. The first two rounds of expansion, calling for an increase of more than 500,000 tons in the U.S. annual production capacity was concentrated almost entirely among the big three aluminium producers, Aluminum Company of America, Kaiser Aluminum and Chemical Corporation and Reynolds Metals Company.

The only new company brought into the industry as a result of the first two expansion programmes was the Anaconda Copper Mining Company which built a plant at Kalispell, Montanna, although two other companies, Olin Industries Inc. and Wheland Company, planned to enter the aluminium industry but dropped the idea after experiencing difficulties in financing.

However, since the third round programme was announced almost two years ago the supply side of the picture has changed considerably. This has been largely due to the successful completion of the Kitimat project and supplies from Canada are now estimated to be substantially above those originally made. Another reason advanced by the O.D.M. for dropping its third round expansion programme was that U.S. military demand for aluminium in a full scale war, particularly by the aircraft industry, would not be as high as originally envisaged.

In any event, it is expected that all the new facilities constructed under the first two rounds of aluminium expansion will be completed and in production before the end of this year, which will raise the total U.S. primary production capacity to 1,540,000 tons a year, or more than double the 1950 output of 719,000 tons.

But if the U.S. Government feels that ample supplies of aluminium are assured a somewhat different view is being taken by Canadian and American interests represented by North-West Power Industries, a Canadian subsidiary of Quebec Metallurgical Industries and Frobisher Ltd., which in turn are subsidiaries of Ventures Ltd. and Reynolds Metals Company of New York. This group has been granted a conditional water licence from the British Columbian Government which makes it possible for them to proceed with a proposed construction of an aluminium plant in the Atlin Lake area of northern British Columbia rivalling in size Alcan's giant Kitimat hydro-electric and smelting project.

New Trends in the Ore Trade

Synchronizing with the news of the despatch of the first consignments of iron ore from Labrador to Philadelphia comes the announcement of the completion at the old Japanese naval dockyard at Kure of the world's biggest ore carrier, a vessel of 66,000 tons dead weight which has been built for the transport of iron ore from Venezuela to the source port on the Atlantic seaboard. Two sister ships are said to be under construction but it seems unlikely that many, if any, more of these ocean giants will be built if only for the reason that they can only operate between fixed terminal ports.

Certainly they dwarf the fleet of ore carriers of 9,000 to 10,000 tons now being built to the order of the British steel makers, but these smaller ships specially designed for the job, with wide hatches and self trimming holds, offer the advantage of much greater versatility. Several of these carriers are already in commission. They can enter and load cargoes in any of the European or African ore ports which would be inaccessible to ships of much greater dimensions, and serviced by the new ore unloading plants which have been or are now being installed in the Tees, Tyne and Clyde and in South Wales, they have achieved substantial economies in transport costs.

With imports of ore now running at the rate of about 12,000,000 tons per annum this is an item of considerable importance in the economy of the British steel trade. In recent years the proportion of foreign ore used in our blast furnaces has increased very rapidly and this rising trend may be given a further impetus by the high price of coke, which increases the cost of reducing home ores with a lower iron content.

The Belgian Congo

(From Our Own Correspondent)

Brussels, July 20.

The Congo was, according to the A.B.M.S., the sixth copper producing country of the world in 1953; the Union Minière contributing 226,795 s.tons and being the second largest producing company in the world. Moreover, development accomplished at the Kolwezi and Musonoi copper mines established the existence of important tonnages of copper and cobalt. The Union Minière is the largest cobalt producer with an output of 8,238 tonnes.

BASE METALS

Symétain was again the chief producer of cassiterite with a total of 5,510 tons (5,114 in 1952), Geomines, however, has the biggest ore reserves but the development of their workings is not yet completed. The company report pays tribute to the Congo Government for having reduced the tin export tax from 11 per cent to 7 per cent from January 1, 1954, and for deciding to finance the Congo share of the tin buffer pool through loans to producers.

In the report to the annual meeting of Symétain on July 9 it was stated that 110 c. per lb. of tin needed to be the floor and not the ceiling price if the Congo tin industry was to exist normally.

Besides tin Symétain also produced 95 tons of wolframite (89 in 1952), 2,640 kilos of tantalum and columbium oxide (410 in 1952), and 703 kilos of cerium ore (14.6 in 1952).

The Kipushi concentrator of the Union Minière produced 242,120 tons of zinc concentrates of which 54,849 tons were treated by Sogechim to yield sulphurous gas for the manufacture of sulphuric acid, and 62,809 tons of roasted concentrates were obtained of which 25,593 tons went to Belgian zinc works besides 86,527 tons of crude concentrates, and 27,012 tons of concentrates went to Metalkat for the manufacture of electrolytic zinc.

The Sté Generale has produced pure germanium oxide for the Union Minière by an electronic process; industrial production is to commence shortly.

PRECIOUS METALS AND DIAMONDS

The total gold production of the Belgian Congo and Ruanda-Urundi was 11,540¼ f.kilos, of which Kilo Moto yielded 7,593 kilos: ore reserves showed little change. The placer recovery per cu. m. was .337 f.grams against .315 grams and 307 grams in 1952 and 1951 respectively. Recovery from reef workings was 5.33 grams per ton (4.60 in 1952) and the total yield 4,966 f.kilos (4,486 in 1952). The unfavourable gold price is leading the company towards discontinuing its alluvial workings and concentrating on reef mining.

Silver Production by the Sté Generale Metallurgique de Hoboken at Oolen was 154,325 kilos from Union Minière concentrates.

The output of gem stones by Forminière fell from 408,706 ct. to 374,185 ct. though the reduction was compensated by a slightly improved quality. Bécéka's yield of industrial diamonds was 12,056,000 ct.

URANIUM AND RADIUM

Strict secrecy being the rule in regard to these two metals, the Union Minière report merely says "the uranium and radium ores of the Shinkolobwe mine continue to be exported after concentration. The Sté Generale's Oolen plant produces the quantities of radium required by the market."

The Indian Manganese Mining Industry

Written before the abolition of the 15 per cent *ad valorem* export duty on manganese ore, which came into effect last week; and before the announcement this week by the Office of Defense Mobilization that the U.S. Government will continue to purchase U.S. produced low-grade manganese ore for the national stockpile; the following article, sent to us from a correspondent in India, analyses the reasons for the slump in the Indian manganese mining industry. Because of these developments much of what is said will no longer apply, but it is instructive to note the disastrous results which can befall an industry when tax impositions are extended beyond the period and circumstances which enabled them to be easily administered and tolerably shouldered.

The current crises in the Indian manganese mining industry has attracted a great deal of attention in recent months (see *Mining Journal* July 16, pages 65, 68 and 69), and has evoked much comment, some of which has been apposite and some, unfortunately, misleading. The chief reasons usually given for the slump are the entry of Russia and Brazil into the world markets, railway wagon shortages and bottlenecks at some ports, notably Calcutta.

Dealing with the above mentioned causes, there is no doubt that the sale of possibly 500,000 tons by Russia to the U.K., Belgium and Germany, beginning in August, 1953, has had an effect, probably psychological more than actual, on world markets, this being the first time Russia has exported manganese ore since 1939. So far as Brazil is concerned, it is very doubtful whether the recent discoveries in the Amapa district, which are being exploited by the Bethlehem Steel Corporation and the U.S. Steel, have yet been put on the market. The earliest date ores from these deposits are likely to be available is 1955/56.

As regards wagon shortage, there is no evidence so far available to show that wagon shortage in Madhya Pradesh is any greater this year than last year and, in any event, the Government of India has been controlling wagons in such a way that certain quantities of the Madhya Pradesh ore are exported through Bombay rather than through Vishakapatnam. Wagons on the western side of India have not been a particularly difficult problem.

The bottleneck at Calcutta port is undoubtedly serious for all export commodities. Nevertheless exports of manganese ore through Calcutta have never been as high as through Bombay and Vishakapatnam, since the manganese mines of Bihar and Orissa are for the most part low grade deposits of comparatively small importance for export.

EFFECT OF U.S. STOCKPILING AND RECESSION

There has undoubtedly been a falling off in the demand for manganese ore by the foreign countries. This falling off has been due to two factors :

(a) the cessation of stockpiling of manganese ore by the American Government in the middle of 1953 assumedly, in view of the large stocks available ;

(b) the slight recession in America which effected the steel industry and reduced its production in terms of capacity from 90 per cent at the beginning of 1953 to 70 per cent at the end of 1953.

With regard to (a) above, it is difficult to say when the American Government will resume stockpiling. However the demand of the American domestic market and of the growing European market should absorb India's normal production of manganese ore without the additional demand of the American Government's stockpiling agencies.

With regard to (b) above, the so-called recession has shown signs of being halted, although despite talk of better times ahead for order prospects, steel production has refused to rise and capacity is running at about 64 per cent.

There is another very important factor in connection with the Indian export trade of manganese ore, which may result in India losing her important share of the world's manganese consumption even when the demand for this commodity has recovered from the effects of America's "recession." This factor is the psychological atmosphere created by the Indian Government's Export Duty and the manner of its assessment during the last two years.

IMPORTANCE OF EXPORT DUTY

The Export Duty of 15 p.c. *ad valorem* has been levied since 1948 and has, of course, been borne by the foreign buyer. Export duties are most unpopular in international markets and are regarded by buyers as a premium placed by a Government on a scarce commodity. The inevitable result of the Indian Export Duty has been (a) to act as a hidden subsidy to competitors overseas; (b) to cause foreign buyers to look strenuously for alternative sources of supply which are not subject to this imposition; and finally, (c) the method of assessment of this duty has been illogical and unbusinesslike (some critics would also say unethical), and that an attitude of resistence has been built up in the minds of foreign buyers, particularly in America towards the Indian product.

With regard to (a) above, the export duty of 15 per cent has enabled India's competitors in Africa, Morocco and elsewhere to increase their prices by a similar amount, the increase being enjoyed by the producers and merchants, so that India's competitors have been able to strengthen their competitive position against the time when the Indian duty will inevitably be removed and when India's competitors should be enabled thereby to produce ore considerably cheaper than India, added to which most of them are geographically situated closer to the consuming markets and enjoy a freight advantage over India.

With regard to (b) above, the large American Steel Corporations, assisted financially by the State aided Export-Import Bank, have been searching successfully for alternative sources of ore, notably in Brazil, where the Bethlehem Steel Corporation and U.S. Steel have received a loan of $66,000,000 from the Export-Import Bank, and, in association with Brazilian interests, have discovered and opened up important deposits in the Amapa district. This ore, as mentioned above, should be flowing into America next year at the rate of probably 500,000 tons per year, some of which quantity would presumably have been bought from India, if these deposits had not come to light. European interests are developing high grade deposits in West Africa, where the U.S. Steel Company are reported to be contemplating the erection of a 250 mile long Ropeway (in French Equatorial Africa) to bring recently discovered ore from an inaccessible part of the jungle to the coast. The imposition of the Export Duty itself even when it was applied in a comprehensible and straightforward manner to Contract rates, has resulted in a deliberate and determined search in other parts of the world by the principal consumers for a mineral not particularly scarce.

With regard to (c) above, the unpopularity of the Export Duty ifself has been magnified one hundredfold since June, 1952, by the extraordinary and short-sighted policy of the Revenue Authorities of the Government of India, who, in that year instructed the Customs Authorities at the main ex-

porting ports to assess the 15 per cent duty, not on the Contract values of individual shipments, but on arbitrary market valuations made by the Customs Authorities. The object of this change of policy was obviously to obtain more revenue during a period of rising prices as the main exporters normally enter into long term contracts.

The big exporters who try to take the long term view consider that long term contracts are more satisfactory to all concerned as they enable the scientific mine owner to plan ahead for the development of his mine which, of course, is in the best interests of the country's resources. They are quite content to receive somewhat lower prices for the much larger quantities they normally sell during the period of rising markets. The "fancy" prices obtained by small speculative miners and merchants who mine and deal in very small quantities during boom periods have no very great significance either for the trade or for the country. Unfortunately, the Central Board of Revenue and the Customs Authorities, in their search for additional revenue, have been penalizing the big shippers (and their foreign buyers) since 1952 by assessing the export duty at the highest rates obtained by speculative shippers and applying these assessments to the long terms contracts of the permanent and substantial shippers. This has, of course, upset the foreign buyers whose calculations and sales to the steel-makers in their own countries, had been made on the basis of 15 per cent of the actual contract rate. Months later these overseas merchants have been called upon by the Indian Authorities to make very heavy additional payments of duty which, in many cases, they have not been able to recover from the actual consumer of the ore. This arbitrary and short-sighted policy of the Indian Authorities has made these merchants more determined than ever not to buy ore from India, if and when they are able to obtain it from alternative sources.

35,000 UNEMPLOYED

To make matters worse, the big shippers from India, who have long term contracts at the top prices obtained during the boom, are now being assessed by the Customs Authorities in the contract rates which are in many cases 60 per cent or 70 per cent higher than current market prices (the ore market having collapsed.) This attitude will further estrange foreign buyers and may result in India losing a substantial portion of her manganese exports to other countries which do not jeopardize their export trade for the sake of immediate revenue. In this connection it may be noted that there are 67 appeals from one exporter alone which have been lying with the Central Board of Revenue for nearly two years and on which no judgment has been given one way or the other, despite repeated representations from the shippers themselves.

It is also worthwhile recording that a member of the Central Board of Revenue gave a personal assurance, first at Delhi and then in Bombay, to three of the principal shippers in Bombay as long ago as June, 1952, and more recently in January, 1953, that if the market should go down and they were fulfilling contracts at a higher rate than the market, then the Customs would assess the duty at the market rate even if it was lower than the contracts. Despite this verbal assurance given by a senior official of the Central Board of Revenue, no such thing has happened and the Customs authorities in Bombay are assessing the duty at the contract rate, now that it is higher than the market rate. In point of fact, the only ore which is now being shipped is on account of the big shippers mentioned above who have entered into long-term contracts and who have been heavily penalized during the rise. The small speculative miners and merchants who obtained fancy prices for spot sales during the boom in which prices were then taken as market values, have all disappeared with the result that there are reported to be 35,000 mine workers out of employment in Bihar and Madhya Pradesh.

THREE FURTHER POINTS

There are three further points in connection with the manganese trade which are much in the minds of the Government of India and about which there has been a certain amount of muddled thinking. These are:

(a) conservation of manganese ore;
(b) beneficiation of low grade ore; and
(c) export of ferro-manganese.

With regard to (a) above, the conservation of manganese ore for India's present and future iron and steel industry is not a matter which need worry the Government of India as it is almost certain that if the reserves of high grade manganese ore throughout the country were to be systematically surveyed, they would be ample for the largest iron and steel industry which India is ever likely to support and at the same time provide for the export of at least 1,000,000 tons of ore annually.

With regard to (b) above, beneficiation of low grade ores is already being undertaken by the largest miners in the country and should be developed in accordance with the economic demand. It is only during periods of abnormal demand, as during the last three years, that the supply of high grade is not adequate for world needs when, of course, the beneficiation of low grade ores would be obviously advantageous. The best method of tackling this problem would be to encourage all mining companies to consider beneficiation as part of their normal production process by the introduction of inexpensive and effective plants, the capital cost of which could easily be written off over a period of years by even the smallest company. The insistence by the Government on the establishment of expensive heavy media separation plants such as installed by the Central Provinces Manganese Ore Co. at Dongri Buzurg is scarcely justifiable and, in any case, can only be undertaken by large producers.

With regard to (c) above, the production of the finished alloy, namely ferro-manganese and its export direct to the steel manufacturers in foreign countries is obviously an attractive proposition in theory for a raw material producing country such as India in as much as the foreign exchange earnings for the finished product are likely to be much higher than for the ore itself, 50 per cent of which is waste material. On the other hand, the chemical difficulties of smelting ferro-manganese to the required specification of the international market are very considerable, particularly in India, where the phosphorus and sulphur contents of Indian ores are considerably higher than in foreign countries. The ferro-manganese which can be smelted in India with the least capital expenditure is below international specification, although satisfactory for Indian steel.

The only alternative is to use hydro-electric power which must be extremely cheap if the proposition is to be economic and there does not seem to be cheap hydro-electric power available in India near enough to suitable manganese deposits to make international specification ferro with hydro power. In addition, the capital expenditure required for a ferro plant would seem to be beyond the reach of India's present resources. Another important consideration is that large consuming countries have invested considerable capital sums in ferro-manganese furnaces and are hostile to the idea of raw material producing countries such as India exporting the product. In America a likely tariff wall against Indian ferro-manganese would cripple the industry before it started. Any counter-threat by India to prohibit the export of manganese ore will probably not worry America now that she has alternative sources of supply in Brazil and Equatorial Africa.

Re-organization Brings Increased Coal Production to Hungary

The re-organization of the Hungarian coal mining industry has been instigated to keep pace with expanding industrial needs, and as a result the introduction of mechanization and modern production methods, together with a training and welfare policy for mine-workers, have been repaid by a substantial increase in the tonnage of coal produced. The following article, material for which was supplied from official Hungarian sources, indicates salient features of this programme and describes some of the equipment pieces which have aided the development.

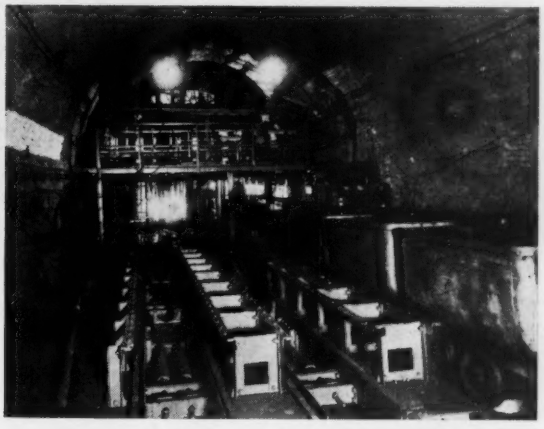
In 1938 Hungarian coal production totalled 9,300,000 tons, yet despite the fact that during the German occupation of the country many mining installations were seriously damaged, at the end of the post-war reconstruction period in 1949 the national output had risen to 11,500,000 tons. This tonnage was further increased during the Five-Year Plan which commenced in 1950, and in 1953 the production of coal reached 21,300,000 tons.

Hungary's coal deposits have been estimated at about 3,400,000,000 tons, consisting mainly of lignite with a calorific value of from 3,800 to 4,700 calories. The possible existence of larger reserves is suggested by the fact that geological survey parties have been sent to mining areas to carry out further reconnaisance.

A reorientation of economic policy took place in Hungary last summer, and since that time there has been a greater expenditure on consumer goods production and less on mining and heavy industry. This, of course, does not mean the abandonment of plans for mining development, but merely that these plans may be envisaged as covering a longer period before completion.

It was announced in 1952 that the Bamert factory in Ujpest, a suburb of Budapest, had gone over to the production of mining machinery, and would be greatly extended in size. This factory makes the F-4 cutter-loader, evolved by two Hungarian engineers, a unit which is used in most Hungarian mines. A machine, of which a few details are now available, is the FR-1 cutter-loader, and is divided in two for use separately. Claimed to be more mobile and less complicated than existing models, the prototype was made last autumn, and production is planned for this year.

An interesting design of coal cutter of Hungarian manufacture



Equipment at Komló for moving tubs into the cage

Hard coal deposits in the Mecsek mountains in southern Hungary are now being greatly developed to provide coking coal for the big new steel plant at Sztálinváros. Prior to the liberation 500,000 tons of coke were imported from Germany, but the exploitation of a new deposit at Komló is expected to cut down the tonnage of imported coke very considerably. Komló coal is being coked at batteries at the Stalin plant. Trade agreements with the Soviet Union, Poland and Czechoslovakia specify the importation of coke to Hungary.

INCREASED MECHANIZATION

Hungarian coal mines were nationalized in 1946, and before that date were characterized by primitive methods of extraction. There has been a steady drive to increase mechanization, however, and it was announced early this year that 441,000 metres of rubber conveyor belting were in use in Hungarian mines compared to 700 metres in 1949. The increase in production came as a result not only of mechanization, but also as a result of increased efficiency on the part of the miners in the operation of mining machinery, after the traditional use of manual methods.

Mechanical transport of coal is also being developed. A new telpher railway, two and a half miles long, has been opened at Várpalota, central Hungary, to carry coal direct from the mines there to the November Seventh power works at Inota. The railway will transport 5,000 tons daily in 24 cwt. carriers. At the power works rubber and steel conveyor belts carry the coal to the boilers. A similar system will be installed at the Stalin Iron and Steel Works to carry coal and iron ore from the Danube river wharves.

EQUIPMENT IMPORTED FROM RUSSIA

Many references have been made in the Hungarian Press to the use in the mines of imported machinery, mainly supplied from the Soviet Union. Four hundred electric and one hundred other types of drills and many other items, including 10,000 metres of conveyor-belt equipment, had been imported from the U.S.S.R. in 1951.

Millisecond delay blasting is now being adopted in Hungarian coal mines, after experiments carried out by a

Hungarian mining engineer. This method, previously used in quarries and metal mines, causes increased fragmentation and reduces ground vibration. The Hungarian experiment has shown that in the case of long-face mining, a conveyor belt can be placed at the foot of the coal face, so that it catches about a third of the coal released by the blast. The remainder is moved onto the belt by hand. The method has been used in a mine in the Tatabánya mining area, and is stated to have increased coal production by over a quester.

OPEN-CAST MINING OPERATIONS

Open-cast mining has also been commenced. Work on a deposit at Szentgál began during 1951, and a new deposit at Tatabánya, said to be two to five metres thick and three to six metres below the surface, is being exploited at the rate of a 1,000 tons a day. Indeed, extensive prospecting for coal has been carried on in recent years. The results of this work are shown by the digging of three new shafts in Várpalota, and in the news of a new 800 metre deep shaft at Komló. New shafts are reported to have been sunk at Petófibánya, Tatabánya, Oroszlány and Pilis.

An open-cut coal deposit in North Hungary. Top spoil is removed by mobile bucket line excavator while the seam is worked by diesel electric crawler-tracked excavator

Working conditions in the mines have also been bettered. Over £700,000 is to be spent during 1954 on improving the ventilation systems, and on other welfare schemes. It is planned to lower mine temperatures to a maximum of 82 deg. F. by the end of 1954. In 1955 a further decline to 77 deg. is foreseen.

The position of miners has also received considerable attention, and their wage-scale has been considerably augmented so that they are now amongst the highest-paid workers in Hungary. At Kazincbarcika an abandoned mine has been adapted for training purposes and an apprentices' school has been opened, where 500 boys undergo a two-year course. Four hundred are trained as hewers, and one hundred as mechanics. They spend three days a week in practical work in a mine, and the rest of the week in the classroom. Komló also has an adult technical school.

The position of managers and technicians has been strengthened to ensure discipline and progress of output, while engineering and technical officials are relieved of administrative work in order to allow for concentration on technical improvements and increased efficiency.

Fires in Pyrites Mines

The introduction into the United Kingdom of the flash-roasting of pulverized iron pyrites as a source of sulphur dioxide has directed attention to the possible risk of spontaneous heating and ignition of pyrites. In view of enquiries received, a review of the subject was prepared by the Fire Research Station of the Joint Fire Research Organization, in which references are made to fires in mines.

FIRES IN THE HUELVA PYRITES MINES

Experience of fires in the Huelva pyrites mines, Spain, is summarized. The ore in these mines consists mainly of cupreous iron pyrites, this being an intimate mixture of iron pyrites and chalcopyrite, occurring with zones in which the chief mineral is chalcocite. Fires occurred either in zones containing the softer and more readily oxidized chalcocite or in primary ore which was either unusually soft or which had been moved or had fallen naturally. They would break out several weeks after such a fall. There was evidence that the primary cause of the fires was the exothermic oxidation of the fractured mineral.

In the absence of combustible material, such as timber, the temperature would rise until sulphur dioxide was evolved. If timber was present, and if the air supply was adequate, the timber would eventually be ignited and cause a "sudden" outbreak of fire. In a limited supply of air the timber was reduced to charcoal, which would ignite when exposed to air during digging-out operations in the fire area. Fires also occurred in heaps of broken mineral and it was noted that heaps of lumps were more likely to heat than heaps of fines, presumably because of reduced air access to the interior of the latter.

The fires were difficult to control, the methods employed being flooding, mining out, and cooling by copious forced ventilation. When an area which had been flooded out was opened up, the fire was apt to break out again. Cooling by ventilation was effective only if large volumes of air could be passed at a high rate; otherwise the rate of reaction was merely increased. It seems probable that, provided the temperature is below 100 deg. C., forced ventilation will be effective by virtue of the removal of moisture and retardation of the reaction as much as by cooling.

INVESTIGATIONS IN THE U.S.S.R.

Investigations of the causes and control of fires in pyrites mines have been carried out in the U.S.S.R. The evidence suggests that the oxidation of pyrites, particularly in a finely divided state and in the presence of a small amount of water, is accompanied by a rapid rise of temperature, but that this rise does not continue to the ignition temperature of the pyrites, because of the greatly reduced rate of oxidation of dry pyrites. It has been suggested that mine fires could be caused by the self-heating of pyrites dust in contact with wood hydrolized by acid mine water.

From their review of the subject, the Fire Research Station conclude that some heating is certain to occur in pulverized pyrites stored in bulk to which air has access, and it may do so to a greater extent than with pulverized coal. If the pyrites is free from moisture the risk of dangerous heating may be considerably reduced, but it cannot be regarded as non-existent. The extent of self-heating to be expected under practical conditions cannot be predicted. It appears that the risk of actual fire depends on combustible materials, such as timber, being in contact with the pyrites.

The Philippine Mining Industry at Mid-Year

The following article, received from a correspondent in Manila, presents a general picture of the Philippine mining industry for the first six months of 1954. All figures have been taken from the official statistics of the Philippine Bureau of Mines and released at the end of last month. Values are expressed in Philippine pesos, 1 peso being equivalent to 3s. 6.6d. and to U.S. 50 c.

The first half of 1954 witnessed a continued decline in gold production in the Philippines, not only in quantity but also in value resulting from the low price of gold in the local free market where all production is sold.

There was a drop in volume of output of base metals, except for copper and iron ore, during the period under review. However, the gain in value of production of these two minerals completely offset the decrease in value of output of other base metals, which resulted in an overall gain of five per cent in total value of production.

Present conditions in the domestic and foreign markets as well as in mining operations in the country indicate that the Government subsidy of $20.86 per oz. for gold mines, when the gold is sold to the Central Bank at $35 per oz., and the tax reliefs extended in legislation recently approved for base metal mines would not result in appreciable benefit to the whole mining industry except for the fact that mines could continue operations for the time being just to maintain their labour force.

Philippine gold mines now are not only working against unfavourable conditions created by the Government itself, but they are also operating in an area of rising costs per oz. produced owing to the general tendency observed over the past few years for the grade of ore to decline in most mines as development work goes deeper underground.

The need is, therefore, to increase milling capacity or locate higher grade ore. But most mines do not now possess sufficient funds to install additional machinery and equipment to increase their crushing capacity. If they do have enough money for this purpose, they still hesitate to undertake expansion in operations because of very uncertain conditions in the mining industry, which are made worse by continued agitation for increase in wages by labour unions.

In view of existing conditions, it is doubted very much whether any mining company can successfully float new offerings in the local capital market to obtain funds for expansion in operations. Foreign exchange restrictions do not freely allow the remittance of dividends to foreign stockholders, and if permitted at all by the Central Bank, remittances are subject to a foreign exchange tax of 17 per cent. Foreign investors, including Americans, have thus been discouraged to furnish funds to open new mines or to help finance expansion of existing operations.

OUTLOOK FOR BASE METAL MINES

Philippine base metal mines depend for their operations on foreign markets, because there is not any single industry in the country which can utilize these minerals. Production, therefore, is restricted only by the demand in foreign markets. The Philippines does not possess the monopoly of the supply of these minerals, although it is the largest single producer of refractory grade chromite in the world and supplies some 80 per cent of the annual requirements of the United States.

However, as production in other foreign sources of supply increases, as it did increase in 1953, foreign consumers are encouraged to offer lower prices. This is now the condition in which the local base metal mining industry has found itself during the first half of the current year. Japan, due to its proximity to the Philippines, is the only market for iron ore as well as for low grade manganese ore produced in this country. Already, Japanese buyers have offered or indicated lower prices to producers after existing contracts expire this year. Since March this year there has not been any shipment of manganese ore to Japan, which confirms the report that offers of Japanese buyers would not make it worthwhile for local operators to make shipments.

MINERAL OUTPUTS JANUARY-JUNE, 1954

Production of gold during the first six months this year registered a drop of 14 per cent, which is equivalent to 33,720 oz. Total production amounted to 207,993 oz. as compared with 241,713 oz. during the same period in 1953.

Value of base metal production during the first half of the year was reported at P31,995,398, a gain of P1,600,000 or five per cent from the value of P30,434,965 during the same period in 1953.

Production of refractory chromite declined by 15,050 tonnes or 6.6 per cent to a total of 213,550 tonnes as compared with 228,660 tonnes produced during the same period last year. In value, production amounted to P6,404,700 which is also 6.6 per cent lower than the value of P6,858,000 in the previous period.

Metallurgical chromite declined by five per cent or 2,121 tonnes to a total of 36,825 tonnes as compared with the production of 38,946 tonnes in the first half of 1953. In value, production was P2,292,256 this year compared with P2,699,909, a drop of 15 per cent.

Except for a small recovery of concentrates at one gold mine and a small quantity reported by a copper mine still under exploration, copper was produced by only one mine during the first six months this year. Total output amounted to an estimated metal content of 7,375 tonnes with a value of P9,578,922 as compared with 5,850 tonnes valued at P6,244,437 during the same period in 1953. The 1954 output represents an increase of 1,525 tonnes or 26 per cent in quantity and a gain of P2,300,000 or 32 per cent in value.

The mine which produced practically all this copper is the Lepanto Consolidated Mining Company, now considered as the largest single producer in the Far East. It operates a mill of 1,000-ton capacity a day and its ore averages over four per cent copper. In addition, the mill recovers gold as a by-product, which has increased this year to 36,552 oz. as compared with 18,223 oz. in the first half of 1953.

Philippine copper production is expected to further increase in the near future with the completion of a 4,000-ton mill in October or November this year at the Toledo copper mine of Atlas Consolidated Mining and Development Corporation in Cebu province, central Philippines. This mine will be the first and biggest mining operation of low-grade disseminated copper ore in the Far East and is expected to double current production in the country.

The first six months of the year again witnessed a sporadic production of manganese ore in the country, and as a result, shipments fell below the amount shipped last year. Production was reported at only 7,253 tonnes with a value of P414,119 as compared with 12,294 tonnes valued at P855,206 during the first six months of 1953. There is a decrease of 41 per cent in quantity and a drop of a little over 100 per cent in value.

MACHINERY AND EQUIPMENT

New Four-Wheel Hydraulic Scraper

Production of a new four-wheel hydraulic scraper, to be known as the Sterling B-695, has been announced by International Harvester Company of Great Britain Limited. Basically, the tractor is intended for use with International 6 and 9 series crawler tractors and it will be sold principally for the Doncaster models, but hydraulic controls are in course of development to permit operations with other makes of tractor of comparable size.

The sterling B 695 scraper operating with the BTD 6

The hydraulic principle of operation was selected for two important reasons. The first is that power control units for cable operation tend to overweight tractors of the 35 to 50 h.p. class; the second, that earthmoving operations in this power group need the additional aggressiveness that can be obtained with positive hydraulic action. Controls for the Sterling scraper are straightforward and effective, two conveniently placed levers falling readily to the driver's hands. One operates the raising and lowering of the bowl with its detachable cutting edge through the medium of two powerful hydraulic cylinders. The second lever raises and lowers the apron and, after the apron is fully raised, operates the forward movement of the ejector plate, the rate of ejection being under full control of the operator, permitting quick dumping or fine grading as required.

The Sterling scraper is the fourth major item of allied equipment to be introduced for the International BTD-6 since tractor production commenced in November, 1953. The unit has a struck capacity of 3.5 cu. yd., a heaped capacity of 5.0 cu. yd., weighs approximately 6,000 lb. when empty and approximately 19,000 lb. when full. It is 18 ft. 3 in. in overall length, 7 ft. 6⅛ in. in width, and 6 ft. 4 in. high.

The Industrial Power Division of the company has just announced an increased h.p. rating for the TD-24, largest crawler tractor in its complete line of industrial power and earthmoving equipment. The present production model of the TD-24 is rated at 190 engine h.p. and 155 drawbar h.p. Maximum drawbar pull is rated at 40,000 lb. and operating weight of the new model is 42,884 lb. The TD-24 is designed to work with scrapers up to 27½ cu. yd. capacity, angle blade dozers up to 14½ ft., and straight blade dozers up to 12¼ ft.

A Simple-operation Spiral Concentrator

The General Electric Co. Ltd. announces that its Fraser and Chalmers Engineering Works, which manufactures a wide range of metalliferous mining equipment, has concluded an agreement with the Humphreys Investment Company of Denver, Colorado, to be the selling agent respecting the sales of Humphreys' Spiral Concentrators for delivery to the United Kingdom, Gold Coast, Gambia, Sierra Leone, Nigeria, Burma, India and Pakistan.

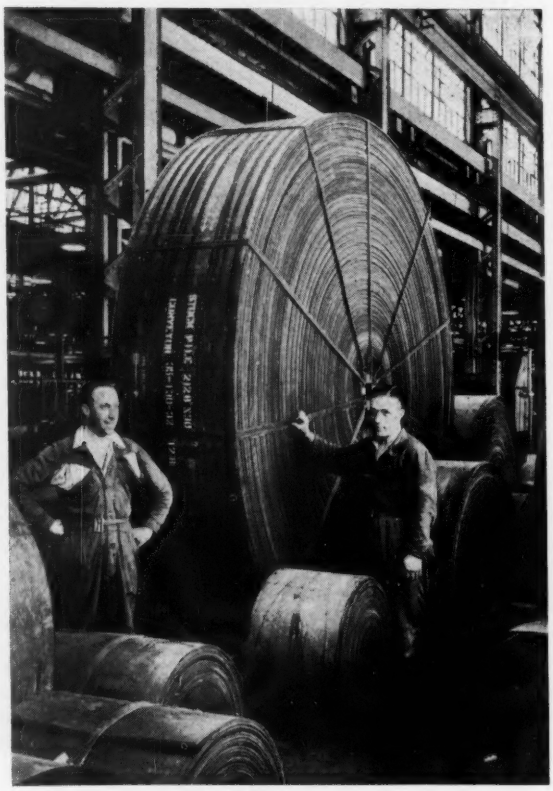
The outstanding feature of the spiral is the simplicity of operation and low cost of concentration of minerals. Ground ore, fine coal, sand or other material to be concentrated or cleaned is delivered with water to the top of the spiral. As the pulp flows down the spiral channel which has a modified semi-circular cross-section, the heavier particles move in towards the inside of the channel on a band of heavy mineral concentrate, while the lighter particles travel farther out in the channel with the faster running water. Concentrate is drawn off from concentrate ports located at 120 deg. intervals near the inside edge of the channel.

There are no moving parts; floor space per ton treated is very small; and installations, maintenance and operating costs are so low that spirals have effected economical concentration of materials which could not hitherto be worked at a profit.

The size range of material suited to spiral separation depends to some extent on the specific gravity of the minerals present, the grind necessary for their liberation, and the shape of the particles. On suitable material good concentration is generally made on pulp containing heavy mineral particles between 14 and 200 mesh, with a decreasing recovery below 200 mesh. However, fine coal up to ¼ in., provided the refuse particles are not over 14 mesh, may be cleaned in spirals.

A Record Single-Length Conveyor Belt

A note in these columns in our issue of July 23, reported that a second record length conveyor belt, made at the Wolverhampton factories of the Goodyear Tyre and Rubber Co. Ltd., had been shipped to British Guiana. We are now able to publish an illustration of the belt which, it will be recalled, is a 2,128 ft. length of Stacker belting. It is of 30 in. 6 ply.



The Stacker belting prior to shipment

Like the preceding belt of these dimensions, the belt is of 32 oz. duck, ⅛ in. top cover and 1/16 in. bottom cover. The belt is for service at McKenzie in British Guiana, where it is to handle bauxite for the Aluminium Union Ltd.

METALS, MINERALS AND ALLOYS

Latest reports from the G.S.A. indicate that this administration is still a long way from completing its domestic purchase programmes for, at any rate, seven strategic and critical materials. These programmes, which were initiated during 1951 and 1952, are scheduled to run through to the end of 1958 unless the targets are reached sooner. At June 30 last, the progress achieved with each of these metals was as follows: *Tungsten,* 985,295 s.ton units delivered against a target of 3,000,000 s.ton units; *Manganese,* 7,762,000 l.ton units of contained manganese delivered against a target of 37,000,000 l.ton units; *Chrome,* 64,282 l.ton units of ore and concentrates against a target of 200,000 l.tons; *Mica,* 3,413 tons of all types delivered against a target of 25,000 tons of hand-cobbed mica or the equivalent; *Beryl,* 266 tons delivered against a target of 1,500 tons; *Asbestos,* 295 tons delivered against a target of 1,500 tons; *Columbium-Tantalum,* 4,666,271 lb. delivered against a target of 15,000,000 lb. of columbium-tantalum pentoxide.

COPPER.—The strike position in the American and Chilean copper mines has deteriorated since our last issue. In the States the stoppage brought about by the Mine, Mill and Smelter Workers' Union at all the Kennecott mines throughout the country, was followed last Monday by a shut-down of mining and fabricating operations in the Anaconda group brought about by the same Union. As we go to press about 33,000 copper workers are idle throughout the States, representing a loss of output equivalent to about 42,000 tons a month. At the same time the strike which threatened the Braden Copper Company's El Teniente mine (Kennecott's Chilean subsidiary) duly eventuated last Thursday and has put out of action approximately half the Chilean production (11,000 to 12,000 tons a month). It is not clear whether there has been a collusion over the timing of the strikes in the two countries, but it is certain that the market is going to be extremely tight unless a settlement can be reached quickly. Current loss of mine production is likely to make itself felt principally in October deliveries and fabricators have already started trying to place orders for that month.

Mine mill Union are asking for an 8 c. an hour wage increase, plus heavy additional increases ranging from 6-12 c. an hour for evening and night shifts together with a $2.50 a month company contribution for group insurance. These demands compare with an average increase of about 7 c. an hour accepted by The United Steel Workers in their recent negotiations with Phelps Dodge, which company in consequence, fortunately remains in active production.

The Chilean miners are demanding a 75 per cent pay increase from Braden which, as we pointed out here last week, is manifestly absurd. At the moment the strikers are expressing their readiness to face a prolonged stoppage. The embarrassment which such a prospect holds alike for Chile's economy and for the American copper market is apparent. If the former proves to be the more immediately acute the American copper companies should find themselves in a strong position to press for further concessions in the new deal legislation (at present being formulated for the Chilean copper industry) in exchange for somewhat larger wage concessions than they would otherwise be prepared to make. In any event, once the strike is over it may confidently be expected that the American companies will restore the production cuts which have been operative during most of this year.

LEAD AND ZINC.—Both the lead and zinc markets have firmed up appreciably in London following President Eisenhowers' announcement of his accelerated stockpile purchases for these metals, the implications of which are considered more fully under "Notes and Comments." Dealings in lead at one time touched £100 and zinc has been as high as £78½. In New York, the price of spot lead hardened to 14¼ c. on Wednesday although the zinc price has so far remained unaffected by the announcement. Supplies of high grade zinc have also been tightening as Anaconda is a large producer in this segment of the zinc industry.

New Jersey Zinc Company has announced that its mine and plant at Franklin, New Jersey, is to be closed from October 1 because there is "no more ore." Some of the workers will be transferred to the Ogdensburg mine which is to be modernized. Franklin has operated for a century.

TIN.—Latest tin study group figures are notable for a sharp increase in the Indonesian output for July which at 3,487 tons constitutes a post-war record for any single month and compares with 2,790 tons in June. Also notable are the improved Bolivian export figures, which were to be expected once deliveries under the new R.F.C. contract got under way. Shipments for May and June have been running at rather better than 3,000 tons a month compared with around 1,600 in the preceding three months. Comparative cumulative totals for the main producing companies are given in the following table:

Country	*Period*	*1954*	*1953*
Belgian Congo	Jan-July	6,137	7,926
Bolivia*	Jan-June	13,186†	17,793
Indonesia	Jan-July	19,449	18,873
Malaya	Jan-July	34,575	32,238
Nigeria	Jan-June	3,781	4,129
Thailand	Jan-May	3,775‡	4,277

* Exports † Estimated ‡ Revised

U.S. tin-plate production also reached an all-time monthly record in June at 616,048 tons including 448,630 tons of electrolytic. U.S. output for the first six months of this year totalled 2,696,564 tons compared with 4,269,543 for the whole of 1953. In reading these figures it must be borne in mind that over the past four years tin conservation technology has brought about a reduction of about 11 per cent in consumption of tin in the tin-plate industry (see this column August 13) and indeed, comparing U.S. consumption over the past two years alone, the first six months of 1954 totalled only 16,980 tons for tin-plate and terne-plate usage compared with 18,180 tons during the first half of 1953. Consumption has also deteriorated in usage for solder and for brass and bronze alloys and the overall U.S. tin consumption for the period January/June, 1954, inclusive of secondary metal, totalled 41,640 tons compared with 44,960 tons in the corresponding period of 1953.

ALUMINIUM.—July production of primary aluminium reached a new peak of approximately 126,162 s.tons, which compares with the previous record of about 125,144 s.tons in May last and with 109,285 s.tons in July, 1953. While market circles in America believe production may show a general rise in the next month or two as additional units built during the industry's second round expansion programme come into production, no substantial increase is expected until next year when the Anaconda Aluminum Company's new reduction plant at Kalispell, Montanna, is scheduled to begin operations.

MANGANESE.—The U.S. Government will not stop its purchases of United States produced low-grade manganese ore for the national stockpile, according to a statement made by the Office of Defense Mobilization earlier this week. But the Government would not expand its purchasing programme at the present time, preferring to "mark time" until results were available from the research projects now being undertaken to see if processing costs could be reduced and also to await the outcome of the review of the quality of manganese ore now held in the U.S. stockpile.

TITANIUM.—Imperial Chemical Industries, General Chemicals Division, have announced that it will increase by tenfold the production of titanium in the U.K., thereby advancing its development of this important new metal beyond the pilot plant stage. As previously announced, William Jessop and Sons, a subsidiary of B.S.A., is to build a titanium melting plant, the "know-how" for which the company bought from the Titanium Metals Corporation of America, which sold to Jessop the proprietory furnace designs and operating knowledge. According to Reuter the Titanium Metals Corporation sold its "know-how" to two U.K. companies, but the name of the other company was not disclosed.

URANIUM.—There has been a good deal of news about uranium this past week, the principal item of interest being that South Australia's £A5,000,000 uranium mine and concentration plant at Radium Hill is due to begin full production in seven or eight weeks' time and the first exports of high grade uranium oxide to Britain and the United States are expected to be shipped early next year. Mr. Thomas Playford, the Prime Minister of South Australia, in making this announcement, added that uranium concentrates would have to be stockpiled until the new refinery at Port Pirie was ready early next year. Elsewhere in Australia interest has centred around the Mary Kathleen Uranium Lease near Mount Isa, Queensland, which Australian Oil Exploration Ltd. bought from a Queensland Syndicate last week. Reuters report that Australian Oil Exploration conducted a preliminary geological survey of the lease area, which indicated a one-square-mile field containing 1,350,000 tons of high-grade ore estimated to be worth more than £A50,000,000.

Iron and Steel

If the shrinkage in steel production in July was much more severe than had been expected there has been a swift and decisive re-action. Buyers are keener than ever to cover their requirements. There are widening opportunities for the expansion of exports and the markets for iron and steel are stronger than ever. With the assured prospect of uninterrupted activity up to the end of the year, it seems likely that new output will be achieved.

One of the difficulties—perhaps the only difficulty—will be the provision of the ampler tonnages of pig iron which the steel makers require.

Although the loss of pig iron production during the holiday period was less than that of steel ingots, the consequences have proved embarrassing. The melting shops require all the basic iron which the blast furnaces can provide, and requirements of the foundry trade are also on a heavier scale. At present, emergency needs can be met by withdrawals from stock, and also by the increase of scrap in the furnace mixtures. But this is the wrong time of the year to be encroaching on the stockpiles. Before winter begins it is the usual practice to build up the resources of materials and under present conditions it is proving very difficult to do so. Thus there is the strongest possible incentive for the attainment of new records in pig iron production as the starting point for steel expansion.

The position of small bar re-rollers has undergone a marked improvement. An influx of home and foreign orders has assured them of full employment for two or three months ahead although they complain that controlled prices are at an uneconomic level and no better terms are obtainable for export orders.

In the finished steel trade boom conditions prevail. Sheet mills can take on no further orders for this year and they are now booking up briskly for deliveries in the first quarter of 1955. Orders for plates and sections similarly outpace production, whilst tube makers, already very busy, have received inquiries for substantial export tonnages.

The London Metal Market

(From Our Metal Exchange Correspondent)

The markets during the week have all shown a better tone with moderate advances in prices.

Tin has been a quiet market, and with prospects of consumption being maintained at a satisfactory level it looks as though available supplies should be well taken care of. The price has had a moderate advance, but violent fluctuations are not expected in the absence of any unforeseen developments. In America the market has been dull with consumers inclined to hold off for the time being. On Thursday morning the Eastern price was equivalent to £740¼ per ton c.i.f. Europe.

The further spreading of the strikes at the copper-producing plants to the Anaconda and American Brass companies h given a firmer tone to the London market, and a moderate advance has been seen bringing prices more into line with th American quotations. On the Continent, consumer demand has continued good, and would probably be even better if the strike of German metalworkers were settled. In America, demand is especially good on fears of a tight supply position developing if the strikes there should be long drawn out.

Lead and zinc have had quite substantial advances since President Eisenhower removed the uncertainty which had prevailed by announcing that he had decided against increasing the import duties on these metals. Instead, it has been decided to increase the purchase of domestic lead and zinc, and these purchase could amount to 200,000 tons and 300,000 tons respectively in the year ending June 30, 1955. Additionally, the Secretary of Agriculture is to open negotiations for the acquisition of foreign lead and zinc in exchange for U.S. surplus agricultural products, and metal so acquired would be held off the market in a special stockpile.

Closing prices and turnovers are given in the following table:—

	August 19		August 26	
	Buyers	*Sellers*	*Buyers*	*Sellers*
Tin				
Cash	£730	£731	£732	£733
Three months	£729	£730	£731	£732
Settlement	£731		£733	
Week's turnover	440 tons		400 tons	
Lead				
Current month	£97¼	£98	£99¼	£99½
Three months	£95	£95½	£97¼	£97½
Week's turnover	3,950 tons		3,575 tons	
Zinc				
Current month	£74½	£74¾	£77½	£77¾
Three months	£74½	£74¾	£77½	£77¾
Week's turnover	2,500 tons		3,725 tons	
Copper				
Cash	£236½	£237	£240½	£240¾
Three months	£235½	£235¾	£237½	£237¾
Settlement	£237		£240¾	
Week's turnover	4,425 tons		5,375 tons	

OTHER LONDON PRICES — AUGUST 26

ANTIMONY

English (99%) delivered, 10 cwt. and over .. .. £210 per ton
Crude (70%) .. .. .. £200 per ton
Ore (60% basis) .. .. .. 22s./24s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) .. .. £483 per ton

OTHER METALS

Aluminium, 99.5%, £156 per ton
Bismuth (min. 2 cwt. lots) 16s. lb.
Cadmium (Empire), 12s. lb.
Chromium, 6s. 5d./7s. lb.
Cobalt, 21s. lb.
Gold, 249s. 8d. f.oz.
Iridium, £45 oz. nom.
Magnesium, 2s. 4d. lb.
Manganese Metal (96%-98%) £225/£262
Osmiridium, £40 oz. nom.
Osmium, £50 oz. nom.
Palladium, £7 10s. oz.
Platinum, £30/£31
Rhodium, £42 oz.
Ruthenium, £22 10s. oz.
Quicksilver, £100 ex-warehouse
Selenium, 35s. 9d. nom. per lb.
Silver 73⅞d. f.oz. spot and 73½d. f'd.
Tellurium, 15s./16s. lb.

ORES, ALLOYS, ETC.

Bismuth .. .. 20% 3s. 3d. lb. c.i.f.
50% 7s. 3d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £13 12s. per ton c.i.f.
" Refractory £13 4s. per ton c.i.f.
Magnesite, ground calcined .. £26-£27 d/d
Magnesite, Raw .. .. .. £10 - £11 d/d
Molybdenite (85% basis) .. 102s. 4d.-103s. per unit c.i.f.
Wolfram and Scheelite (65%) .. 117s. 6d. per unit c.i.f.
" " " .. U.K. Government Stock unit d/d 187s. 6d. per unit inc. charges
Tungsten Metal Powder .. .. 16s. 7d. nom. per lb. (home) (98% Min. W.)
Ferro-tungsten .. .. .. 13s. 7d. nom. per lb. (home)
Carbide, 4-cwt. lots .. .. £37 6s. 3d. d/d per ton
Ferro-manganese, home .. .. £54 15s. 0d. per ton
Manganese Ore Indian c.i.f. Europe (46%-48%) .. .. .. 68d./70d. per unit nom.
Brass Wire .. .. 2s. 6d¼. per lb. basis
Brass Tubes, solid drawn .. 1s. 10⅞d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

Last week's easier trend was continued in the beginning of the current period. Later, gilt-edged recovered. The improvement was started by news of the Treasury decision voluntarily to repay $112,000,000 borrowed from the International Monetary Fund during the financial crisis of 1947-48. In addition, the latest revenue returns continued to improve and the overall deficit for the year to date is now some £112,000,000 less than the corresponding period last year.

Kaffirs suffered a shake-out prior to the start of dealings for the new account on Wednesday. Prices given in the list below reflect this and do not fully show the extent of the recovery which took place later. In the finance house group, popular counters were Consolidated Mines Selection, Union Corporation, West Witwatersrand and Anglo American Corporation.

Among individual Rand mines, East Champ d'Or were a feature at 13s. 6d. due to reports that gold production figures may improve. Some of the older propositions, such as Crown and Robinson Deep, were also popular, and the latter reached their highest level since 1951. Sub Nigel in the Union Corporation Group also went ahead. Uranium issues lost their recent appeal and Randfontein, Western Reefs and Luipaards Vlei all eased. The Rand profit figures for July were the best since December, 1952.

The Orange Free State section again attracted the bulk of the business, and active trading by professional operators was reported from Johannesburg. The main topic in this section was the important financing operations in OFSITS. Anglo American and De Beers exercised their option to convert some £3,000,000 of loan money into equity at 60s. Conversion rights attached to a new loan are fixed at 80s. Following the news, a sharp rise in price occurred and the shares finished at 77s. level. The exceptional results from President Brand again brought in buyers and initial results will be eagerly awaited. Elsewhere in this market, stocks were affected by the general shake-out, but here also signs of a resurgence of interest became apparent on Wednesday. Press and market comment on the speculative possibilities of Freddies, coupled with calculations of the underlying asset value, brought in buyers of the shares.

In West Australians there was little of interest to report and prices tended to drift. The bid for Boulder Perseverance shares was announced as 9s. 6d. or 65 Gold Mines of Kalgoorlie (Aust.) shares for 100 Boulder Perseverance.

In the miscellaneous gold section, reports of possible government assistance steadied Indian mines. St. John d'El Rey turned easier, due to political developments in Brazil.

Diamonds were little changed but De Beers turned harder in connection with the OFSIT financing. Platinum shares were again easier.

Coppers, which began easier, recorded scattered gains and the previous falls were cut towards the end of the week. Tharsis were again in demand and Tanks were an outstanding feature with a sharp jump. Mountain Copper attracted considerable attention and were brought up to 11s. 9d. The company which operates in California has been ploughing in profits from its phosphate subsidiary for some years past and the chairman hinted that this policy might well be ameliorated before long.

Eastern tin shares were quiet and generally easier despite the better tone in the metal market. In the Nigerian section, renewed press comment on columbite possibilities and the publication of increased output figures caused scattered rises. Beralts were unaffected by the cut in the price of tungsten and the shares advanced due to speculative buying in front of the dividend. Geevor were again up on further consideration of the sale of copper and possible tin profits despite the reduced output. Barriers and San Francisco Mines of Mexico improved on the U.S. Government decision to continue zinc stockpiling and not to impose import tariffs.

Elsewhere, Consolidated Murchison were again higher due to Cape buying, and International Nickel rose after the better half-year figures and the chairman's comment with regard to the use of the metal by the electronic industry.

FINANCE	Price Aug. 25	+ or — on week
African & European	3 1/16	—1/8
Anglo American Corpn.	7 3/4	—3/8
Anglo-French	22/6	—1/3
Anglo Transvaal Consol.	25/7½	—7½d
Central Mining (£1 shrs.)	39/9	—1/6
Consolidated Goldfields	53/-	—9d
Consol. Mines Selection	37/6	—1/3
East Rand Consols	3/4½	—6d
General Mining	4 1/16	—1/8
H.E. Prop. 5/- Shares	10/7½	—1½d
Henderson's Transvaal	7/3	.....
Johnnies	48/-	—1/4½
Rand Mines	4	.....
Rand Selection	44/4½	—7½d
Strathmore Consol.	42/6	—1/10½
Union Corp. (2/6 units)	34/3	+9d
Vereeniging Estates	4 1/16	+1/32
Writs	38/1½	—1/7½
West Wits	43/3	—6d
RAND GOLD		
Blyvoors	35/6	—9d
Brakpan	8/-	—3d
City Deep	16/-	.....
Consol. Main Reef	21/3	.....
Crown	42/6	+1/3
Daggas	73/9	.....
Doornfontein	26/3	—9d
Durban Deep	32/6	—7½d
E. Daggas	10/9	—3d
E. Geduld (4/- units)	28/6	.....
E. Rand Props	2 3/8	—3/32
Geduld	3 3/4	+1/16
Govt. Areas	13/3	—9d
Grootvlei	19/9	—6d
Libanon	11/-	—3d
Luipaards Vlei	22/3	—1/-
Marievale	19/-	—6d
Modderfontein East	15/-	.....
New Kleinfontein	12/3	—3d
New Pioneer	14/6	—1/9
Randfontein	69/9	—2/6
Robinson Deep	18/3	+1/-
Rose Deep	14/4½	—1½d
Simmer & Jack	4/3	—1½d
S.A. Lands	21/10½	+7½d
Springs	3/9	—3d
Stilfontein	29/7½	—1½d
Sub Nigel	40/-	+7½d
Van Dyk	3/10½	—1½d
Venterspost	11/9	—9d
Vlakfontein	14/9	—3d
Vogelstruisbult	37/-	—3d
West Driefontein	6 5/16	.....
W. Rand Consolidated	53/9	—7½d
Western Reefs	51/3	—1/-
O.F.S.		
Freddies	6/9	—6d
Freddies Consolidated	20/-	—1/-
F. S. Geduld	5 1/8	—1/16
Geoffries	15/6	—1/6
Harmony	39/-	—6d
Loraine	13/7½	—3d
Lydenburg Estates	21/6	+1/6
Merriespruit	13/-	—3d
Middle Wits	15/6	—1/-
Ofsits	75/3	+2/-
President Brand	76/-	+2/3
President Steyn	38/3	—9d
St. Helena	31/-	—3d
Virginia Ord.	16/4½	+3d
Welkom	23/3	—9d
Western Holdings	4 3/32	.....
WEST AFRICAN GOLD		
Amalgamated Banket	1/6	.....
Ariston	6/1½	—1½d
Ashanti	19/9	—3d
Bibiani	4/7½	.....
Bremang	1/9	.....
G.C. Main Reef	3/3	—3d
Konongo	2/3	—1½d
Lyndhurst Deep	10½d	.....
Marlu	1/1½	.....
Taquah & Abosso	2/3	—3d
W. Selection & Dev.	6/1½	—1½d
AUSTRALIAN GOLD		
Boulder Perseverance	8/9	+9d
Gold Mines of Kalgoorlie	15/10½	—4½d
Great Boulder Prop.	9/6	—4½
Lake View and Star	15/6	.....
Mount Morgan	18/6XD	.....
North Kalgurli	7/9	.....
Sons of Gwalia	5/9	—3d
Western Mining	13/9	—9d
MISCELLANEOUS GOLD		
Cam and Motor	9/1½	—3d
Champion Reef	4/7½	—1½d
Falcon Mines	8/-	—3d
Globe & Phoenix	24/-	.....
G.F. Rhodesian	6/3	—1½d
London & Rhodesian	4/4½	—3d
Motapa	2/-	.....
Mysore	5/6	+1½d
Nundydroog	6/6	.....
Ooregum	4/-	.....
MISCELLANEOUS GOLD (contd.)		
St. John d'el Rey	16/6	—6d
Zams	37/6	—3d
DIAMONDS & PLATINUM		
Anglo American Inv.	6 9/16	+1/16
Casts	26/-	—1/3
Cons. Diam. of S.W.A.	6 1/16	.....
De Beers Defd. Bearer	5 15/32	+1/8
De Beers Pfd. Bearer	17½	+1/2
Pots Platinum	9/4½	—1½d
Watervaal	14/9	—1/-
COPPER		
Chartered	79/3	—1/-
Esperanza	5/3	—6d
Indian Copper	5/3	+6d
Messina	4 11/32	.....
Nchanga	8 13/32	—1/32
Rhod. Anglo-American	71/-	+3d
Rhod. Katanga	9/4½	+1½d
Rhodesian Selection	18/1½	—7½d
Rhokana	25 1/2	—1
Rio Tinto	36½	—1/2
Roan Antelope	18/-	—6d
Selection Trust	45/-	.....
Tanks	99/6	+2/3
Tharsis Sulphur Br.	3 1/32	+1/16
TIN (Eastern)		
Ayer Hitam	26/-	—1/-
Gopeng	8/-	—1½d
Hongkong	7/7½	—1½d
Ipoh	16/6	.....
Kamunting	7/10½	—3d
Kepong Dredging	3/7½	—4½d
Kinta Tin Mines	10/-	—3d
Malayan Dredging	27/-	—4½d
Pahang	11/1½	.....
Pengkalen	8/6	—6d
Petaling	7/7½	—3d
Rambutan	16/6XD	—6d
Siamese Tin	7/-	—3d
Southern Kinta	17/4½	+1½d
S. Malayan	25/-	—3d
S. Tronoh	9/7½	—1½d
Sungei Kinta	10/4½	—1½d
Tekka Taiping	5/3	—1½d
Tronoh	25/-	—3d
TIN (Nigerian and Miscellaneous)		
Amalgamated Tin	14/10½	+1½d
Beralt Tin	25/3	+1/6
Bisichi	6/3	.....
British Tin Inv.	15/1½	—1½d
Ex-Lands Nigeria	3/1½	.....
TIN (Nigerian and Miscellaneous) contd.		
Geevor Tin	12/9	+9d
Gold & Base Metal	2/10½	.....
Jantar Nigeria	8/9	.....
Jos Tin Area	13/7½	+1½d
Kaduna Prospectors	2/3	.....
Kaduna Syndicate	2/6	+3d
London Tin	6/3	.....
United Tin	3/1½	—1½d
SILVER, LEAD, ZINC		
Broken Hill South	52/6	+1/-
Burma Mines	2/3	.....
Consol. Zinc	35/6	+6d
Lake George	6/6	.....
Mount Isa	43/9	.....
New Broken Hill	27/6	.....
North Broken Hill	66/3	.....
Rhodesian Broken Hill	10/10½	—3d
San Francisco Mines	18/9	+4½d
Uruwira	3/9	+1½d
MISCELLANEOUS		
BASE METALS & COAL		
Amal. Collieries of S.A.	46/-	.....
Associated Manganese	46/9	—7½d
Cape Asbestos	24/-	+4½d
C.P. Manganese	43/6	+1/3
Consol. Murchison	58/1½	—1/3
Mashaba	3d	.....
Natal Navigation	3 1/16	.....
Rhod. Monteleo	1/3	.....
Turner & Newall	86/6	—1/-
Wankie	14/7½	—1½d
Witbank Colliery	4½XD	+1/16
CANADIAN MINES		
Dome	$28½	.....
Hollinger	$33	—½
Hudson Bay Mining	$87¼	—1
International Nickel	$82	+⅛
Mining Corpn. of Canada	£5½	+⅛
Noranda	$137	—½
Quemont	£7⅜	+⅛
Yukon	3/7½	—1½d
OIL		
Anglo-Iranian	15 1/16	—1/16
Apex	26/10½	—7½d
Attock	48/3	—1/1½
Burmah	92/6	.....
Canadian Eagle	32/3	—3d
Mexican Eagle	18/9	+6d
Shell (bearer)	5½	—⅛
Trinidad Leasehold	23/9	—9d
T.P.D.	24/6	+1½d
Ultramar	27/3	—1/-

COMPANY NEWS AND VIEWS

S.A. Gold Mining Profits Return to 1952 Level

The favourable labour climate which prevails in the South African gold mining industry undoubtedly had a lot to do with the rise in combined profits of Transvaal and O.F.S. mines last month which at £3,263,576 touched the highest level since October, 1952.

At the Transvaal mines from an amount of 5,021,700 tons of ore milled (the highest since October, 1952) working profits of £3,101,305 were earned. This compares with June figures of 4,885,700 tons milled from which profits of £2,994,320 were made. Compared with June, average working costs per ton during July fell 3d. to 37s. 4d.

What is even more encouraging is that this improvement should have been possible at a time of increasing productivity in the O.F.S. In July a total of £162,271 represented working profits of the new field as against £119,501 in June. Here also, tonnages milled rose by 17,500 tons to 352,000 tons while average working costs fell sharply by 1s. 3d. to 48s. 3d.

Anglo American and De Beers Exerise "Ofsits" Options

The Anglo American Corporation of South Africa, together with De Beers Investment Trust, have decided to exercise their options over 1,000,000 Orange Free State Investment Trust 10s. shares at the price of 60s. per share. The right to do this was granted to the two companies in 1951 for a period of six years until 1957 in return for loan facilities up to £3,000,000 at a rate of 3 per cent which will now be liquidated.

It is also announced that Anglo American will take over at par the unsecured loan of £832,500 advanced by "Ofsits" to Free State Geduld. The proceeds of this transaction will then enable an amount of £135,000 owed by "Ofsits" to Anglo American to be repaid while also bringing additional liquidity to the company.

With the object of providing funds for "Ofsits" to participate more fully in O.F.S. investment opportunities which arise over the next two or three years, it has further been arranged that Anglo American, together with De Beers Investment, should grant new loan facilities of £2,500,000 at an interest rate of 6 per cent carrying the right to subscribe until December, 1957, for a further 625,000 "Ofsits" shares at 80s. The funds resulting from the conversion of these shares would, at that time, be applied in repayment of the loan.

That growing confidence in the future of the O.F.S. will be strengthened by this latest announcement is certain. Indeed, while from "Ofsits" point of view a great burden of interest payment has been lifted, it is good to see the eagerness with which De Beers and Anglo American are ready to make available further loan facilities from their own resources. In a market which at present shows such future promise, however, it is perhaps permissible to consider the advantages which might arise from making a public issue involving about the same number of shares which are to be issued under option. Given favourable market conditions this could bring in very much the same total which is now being made available without incurring interest charges. On the other hand, the Anglo American Corporation still has O.F.S. properties on its hands which may soon require further money. It is possible, therefore, that in preference to assisting in "Ofsits" finances the public will be asked to supply funds for these undertakings.

Freddies' Loss

A true comparison cannot be drawn between the financial year ended March 31, 1954, of Free State Development and Investment Corporation and that previously, due to the inclusion of non-recurring profits in the preceding period of about £79,000 arising from sales and other arrangements regarding the company's land. Nevertheless, it is apparent, that while falls in investment income and share dealing profits have been to some extent offset by falls in expenses, if normal profit and loss figures only are considered, this year's loss of £6,566 would compare with a profit last year of only £5,060 instead of £83,764 shown in the accounts. However, as a result of the year's loss, the balance of unappropriated profit carried to the balance sheet was reduced to £77,198 from £83,764 previously.

Freddies' principal asset (apart from its property, mineral and participation rights and options valued at cost at £376,886) is its investment portfolio in O.F.S. gold mining companies. These were shown at cost of £1,030,625 on the company's balance sheet at March 31, and although stock exchange values at that date put their worth at only £946,161, the recent gold market rise will have done much to alter the situation. Investments comprise 656,999 £1 shares in Freddies Consolidated Mines, 59,552 ordinary 5s. shares and 8,630 6 per cent registered notes in Harmony Gold Mining, 38,605 5s. stock units in Merriespruit Gold Mining and 216,624 5s. stock units in Virginia Gold Mining. Unquoted investments are valued at cost of £75,597.

Drilling operations during the year were restricted to one borehole which was abandoned as only poor results were obtained. It is stated that it is unlikely that further prospecting or drilling operations will be undertaken by the company in the future. Stores, material and equipment on hand will therefore be disposed of as opportunities arise.

Strike Hits Indian Copper

The substantial decrease in earnings by the Indian Copper Corporation during the year ended December 31, 1953, was largely due to a strike which disrupted work for over three months. Total revenue, therefore, fell to a total of £1,499,270 as compared with £2,137,361 previously. After expenses at the mine, London and Calcutta profit for the year, before taxation, fell to £410,982 against £687,180 in the preceding period. After depreciation and taxation this amount was further increased to £149,600 as compared with £215,833 previously. A dividend of 10 per cent, against 12½ per cent last year (both free of Indian income tax) was declared on the company's issued ordinary capital of £914,200 in stock units of 2s. each. An amount of £75,000 was placed to general reserve (£185,000) and unappropriated profits carried to the balance sheet fell to £76,278 as against £93,098 previously. A total of 254,072 s.tons of ore were milled during the year averaging 2.3 per cent copper which compares with 346,285 s.tons averaging 2.1 per cent copper previously. Production of refined copper amounted to 4,920 tons as compared with 6,079 tons.

G.M. Kalgoorlie (Aust.) Offers Two Alternatives

Following the recent bid for the whole of the issued capital of Boulder Perseverence made by Gold Mines of Kalgoorlie (Aust.), it is now disclosed by Lazard Brothers, acting on behalf of the purchasers, that the terms offered have two alternatives. The first is a payment of 9s. 6d. sterling for each 4s. Boulder Perseverence stock unit while the second, subject to approval by the Capital Issues Committee offers 65 GMK (Aust.) shares in exchange for 100 4s. Boulder Perseverence stock units.

While present market prices of 15s. 9d. for G.M.K. (Aust.) and 9s. 1½d. for Boulder Perseverance make the share offer the more attractive alternative, the market must be expected to settle for the time being at a level which narrows the margin between both possibilities, yet if shares are to be compared with cash, the selling commission must be deducted from the share price. It should also be remembered that the cash offer is the more likely of the two.

Western Selection and Development Group June Quarterlies

As compared with the March quarter of the current year two companies—Amalgamated Banket Areas and Ariston—in the Western Selection and Development group (formerly the Gold Coast Selection Trust) report increased profits, while a third, Bremang, has turned last quarter's loss into a profit.

Company	*Sept. Qtr. 1953*	*Dec. Qtr. 1953*	*Mar. Qtr. 1954*	*June Qtr. 1954*
Amalgamated Banket	73,746	72,027	51,294	79,954
Ariston Gold Mines ...	105,740	122,744	149,954	165,418
Bremang Gold ...	23,531	21,227	18,181*	907
Gold Coast Main Reef	45,247	36,556	54,665	45,390
Marlu Gold	53,454	47,940	29,840	28,824

* Loss

A.B.A.'s quarterly figures reveal that costs are running below last year's cumulative level, but taking the same comparison, there has been a decline in the grade of ore recovered. Ariston has announced encouraging development progress on the No. 23 level of the mine's North Orebody—the sampling of 493 ft. in this section gave a value of 8.1 dwt. over a width of 90 in. At Bremang, No. 2 Dredge was again in working order which must have contributed greatly towards turning the previous loss into a small profit. Good progress has also been made with the recommissioning of No. 1 Dredge in its new area. On the other hand, at Gold Coast Main Reef, profits have declined to about the same level as at the end of September last year. But milling costs at 67s. 6d. per ton are well below last year's cumulative figure of 80s. 1d. Marlu's profits continue to decline.

SENIOR MINING ENGINEER, NIGERIA. Vacancy exists for a Senior Mining Engineer for Group of Tin and Columbite Mining Companies in Northern Nigeria. The successful applicant should be under 40 years of age and should possess mining qualifications; a good record; executive ability and be willing to take on any mining position within the Group as directed. The engagement would be with a view to permanency and promotion in due course to the topmost position. Basic commencing salary will be £120 to £130 per month, plus cost of living allowance of £12 10s. per month. Free passages, furniture, accommodation, etc. Tour overseas two years, followed by four months' leave from door to door; 10 per cent Provident Fund. Free passages for wife and family after qualifying period. The engagement will be effective from January 1, 1955. Original references should not be enclosed with application. Write, stating age, experience, qualifications, etc., to Box 289, Walter Skinner Ltd., 20 Copthall Avenue, London, E.C.2.

HER MAJESTY'S COLONIAL SERVICE

Vacancies exist in the Research Division, Mines Department, Federation of Malaya, for (a) One Chief Research Officer (BCD 99/60/03) and (b and c) Two Research Officers (BCD 99/23/01).

Qualifications:

(a) Honours degree in Mining or Science: research and practical mining experience.

(b) Graduate in Mining Engineering, preferably with experience of prospecting and mining techniques, especially in diamond drilling methods.

(c) Graduate in Mining Metallurgy or Chemical Engineering preferably with Honours degree and/or some post graduate research experience in any of these fields.

Duties:

(a) Planning and carrying out mineral dressing tests and investigating and applying new techniques. Planning the investigation of ore reserves. Disseminating technical mining information.

(b) Investigations involving prospecting by methods other than geographical and research into mining methods.

(c) Research into mining and mineral dressing problems and application of results, through pilot stages, to utilization in the field. The work will be carried out in the Research Laboratories of the Department and in the field.

Terms of Appointment:

(a) On contract for three years in first instance with consolidated salary of £2,408 per annum. Gratuity at rate of £70 for each three months of resident service on satisfactory termination of contract.

(b and c) Pensionable with consolidated salary in the scale £1,005 - £2,044 per annum.
In each case variable temporary allowances according to family commitments are payable.

Applications should be made in writing to the Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, Westminster, S.W.1 (from whom further particulars can be obtained), quoting appropriate reference number and brief particulars of age, qualifications and experience.

DIVIDENDS

Barrow, Hepburn and Gale 10% *i* (Sept. 9)
Boulder Perseverance 12½% (Sept. 9)
General Electric 8¼% (Sept. 30)
International Nickel 50 c. (Sept. 20)
Komata Reefs Gold 12½% * (September 21)
Larut Tinfields 20% (September 15)
National Bank of India 7% (September 23)
Pengkalen Pref. and Ord. 15% *i* (September 8)
Transvaal and Delagoa Bay Investment 27½% (September 21)
Witbank Colliery 8¾% (September 24)
i interim * tax free

Applications are invited for the following posts with the Punjab Government (Pakistan). Contract period five years in the first instance:

(1) PROFESSOR OF MINING ENGINEERING. Age between 40-50 years, upper limit relaxable in deserving cases. Qualifications: B.Sc. or Ph.D. in Mining Engineering or full Membership of the Institution of Mining Engineers. Two years' experience in mining institution and mine work in responsible capacity coupled with five years' teaching experience of Mining Engineering. Salary: Rs. 1,600 x 100 - 2,000 with free unfurnished house or 10 per cent of pay as house rent and £30 overseas pay, plus other allowances.

(2) LECTURER IN MINING ENGINEERING. Age 25 to 35 years, upper limit relaxable. Qualifications: B.Sc. Honours in Mining Engineering with at least three years' apprenticeship or service in the mines. Teaching experience will be preferred. Salary: Rs. 350 x 25 - 500/30 x 530/30 x 770/40 x 850, plus £15 overseas pay with free unfurnished house or 10 per cent of pay as house rent, and other allowances.

(3) LECTURER IN MINING ENGINEERING (METALLURGY). Qualifications: B.Sc. (Honours Metallurgy). Three years' experience in Metallurgy or Assaying Laboratory or Dressing work. Teaching experience preferred. Age, salary, and other conditions, same as for Mining Engineering above. Higher start possible on basis of age, experience and special qualifications. Current rate of exchange: 2s. 2d. to the rupee.

Application forms and detailed particulars obtainable on request from the Educational Attache, Office of the High Commissioner for Pakistan, 39 Lowndes Square, London, S.W.1. Closing date for receipt of applications: September 6, 1954.

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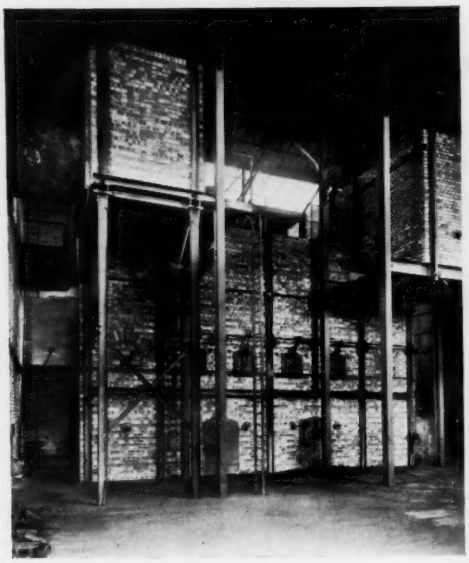
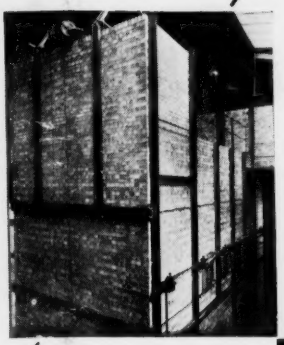


The Gases pass through four banks of Electrodes



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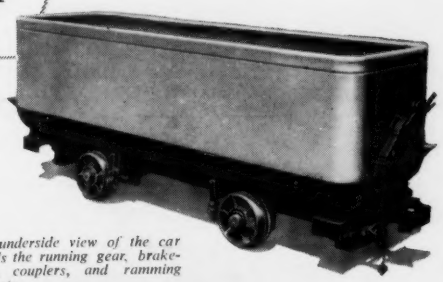

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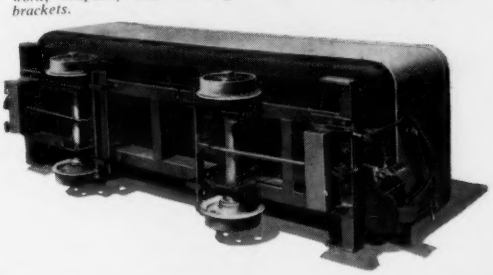

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